

fluorination, hydrogenation, dehydrogenation, nitration, water gas shift, reverse water gas shift, autothermal reforming, combustion, hydrocracking and hydrodesulfurization.

^{15'}
~~25.~~ The method of claim ¹³~~23~~ wherein the porous structure has geometrically regular porosity.

^{16'}
~~26.~~ The method of claim ¹⁵~~25~~ wherein the geometrically regular porosity is formed by a honeycomb or parallel pore structure.

^{17.}
~~27.~~ The method of claim ¹³~~23~~ wherein the porous structure is in the form of a felt.

^{18'}
~~28.~~ The method of claim ¹³~~23~~ wherein the porous structure has a pore size of from about 0.1 μm to about 200 μm .

REMARKS

Claims 1-15 are pending. By the foregoing amendment, claims 10 and 11 have been amended. The amendment to claim 10 is to clean up informalities, particularly to ensure that the "said" terms have proper antecedent basis. New claims 16-28 have been added. Support for the amended and added claims can be found at page 6, line 11- page 7, line 11 and elsewhere in the specification.

Rejections under 35 U.S.C. §§ 102(b) And 103 In View Of van Wingerden

Claims 10-11 have been rejected under 35 U.S.C. 102(b) as being anticipated by van Wingerden et al., U.S. Patent No. 5,366,719 (hereinafter, "van Wingerden"). Claims 12-14 have been rejected under 35 U.S.C. §103 in view of van Wingerden. These rejections are respectfully traversed.

In general terms, a major difference between the present invention and van Wingerden is: the present invention defines a flow-by system while van Wingerden requires a flow-through system. In terms of the specific claim language, (1) van Wingerden's catalyst does not define at least a portion of a wall of a microchannel that defines a bulk flow path; (2) van Wingerden does not flow a reactant "past" a porous catalyst (in van Wingerden's system, all the flow goes through a porous catalyst); (3) in van Wingerden, the reactant does not diffuse transversely into a porous structure; and (4) in van Wingerden, the product does not diffuse transversely into a bulk flow path.

A cross-section of a reactor of the present invention is shown in Fig. 1. As explained on page 5, a reactant **102** enters the microchannel bulk flow path **100**, then diffuses into porous catalyst **106** where it reacts to form a product; and then the product **104** molecularly diffuses back into the bulk flow path. As explained at page 4, lines 5-9, the present invention has a reduced pressure drop because the flow through the bulk flow path passes and contacts the porous structure but is not required to flow through the porous structure. Sufficient reaction still occurs because of the net flux through molecular diffusion into and out of the porous structure.

The van Wingerden patent is limited to flow-through reactors and even teaches away from flow-by reactors. van Wingerden's clearest description of how a reactor was actually made

is at col. 13, lines 49-51, in which alloy powder was poured into a tube, densified by vibration and then sintered. The resulting reactor must have a flow-through catalyst. Similarly, the figures in van Wingerden show a flow-through catalyst. Still further, van Wingerden teaches that reactors with coated walls (col. 3, lines 49-65) or coated monoliths (col. 4, lines 17-31) are undesirable because reactants pass through without reacting. Thus, van Wingerden teaches that flow-by should be avoided because reactants would pass through without reacting - a problem that applicants solved by operating in microchannels.

The pores in a porous catalyst (such as the pores formed by the interstitial spaces in van Wingerden's sintered particles) are not "bulk flow paths." Applicants' specification cannot be read to interpret pores as "bulk flow paths." See, for example, page 5, lines 14-16 "The porous structure **106** has pores **200** or porosity that resists bulk flow (reactant **102**, product **104**) therethrough." Thus, van Wingerden's patent does not teach any of the four (4) claimed elements listed above. Accordingly, withdrawal of the rejections in view of van Wingerden is respectfully requested.

Rejection under 35 U.S.C. 112, second paragraph

Claim 11 has been rejected under 35 U.S.C. 112, second paragraph as being indefinite. This rejection is respectfully traversed. Persons skilled in the art would know that the "CO₂ reforming" and "partial oxidation" are distinct processes. Therefore, withdrawal of the section 112 rejection is respectfully requested.

Conclusion

Applicants submit that the application is in condition for allowance. If the Examiner has any questions or would like to speak to Applicants' representative, the Examiner is encouraged to call Applicants' attorney at the number provided below.

Respectfully submitted,

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